

What is claimed is:

1. A reception apparatus comprising:

first timing estimating means for performing timing estimation of a received signal at a first sampling timing to output a first timing estimated result, while performing timing estimation of said received signal at a second sampling timing with a predetermined phase difference with respect to said first sampling timing to output a second timing estimated result;

10 switching control means for switching said first sampling timing and said second sampling timing; and

second timing estimating means for performing timing estimation with time resolution twice that in said first timing estimating means using said first timing estimated result and said second timing estimated result.

2. A reception apparatus comprising:

first timing estimating means for performing timing estimation of a received signal at a first sampling timing with a predetermined phase difference with respect to a reference sampling timing to output a first timing estimated result, while performing timing estimation of said received signal at a second sampling timing with a predetermined phase difference with respect to said reference sampling timing to output a second timing estimated result;

switching control means for switching said first

sampling timing and said second sampling timing; and

second timing estimating means for performing timing estimation with time resolution twice that in said first timing estimating means using said first timing estimated result and said second timing estimated result.

3. The reception apparatus according to claim 2, wherein said apparatus has a plurality of second sampling timings.

10 4. The reception apparatus according to claim 1, wherein the second timing estimating means performs timing estimation with the time resolution twice that in said first timing estimating means, based on reliability information obtained from said first timing estimated result and said second timing estimated result  
15 in the first timing estimating means.

5. The reception apparatus according to claim 4, wherein the second timing estimating means performs timing estimation by interpolation using the first  
20 timing estimated result, the second timing estimated result and the reliability information.

6. The reception apparatus according to claim 1, further comprising:

control means for controlling a period of an  
25 operation mode in which the first sampling timing and the second sampling timing are switched.

7. The reception apparatus according to claim 6,

wherein during a mode other than said operation mode, a phase is fixed to the phase corresponding to the timing estimated result obtained in the second timing estimating means during a previous operation mode.

5           8.     A       transmission/reception       apparatus comprising:

          first timing estimating means for performing timing estimation of a received signal at a first sampling timing to output a first timing estimated result, while  
10   performing timing estimation of said received signal at a second sampling timing with a predetermined phase difference with respect to said first sampling timing to output a second timing estimated result;

          switching control means for switching said first  
15   sampling timing and said second sampling timing;

          second timing estimating means for performing timing estimation with time resolution twice that in said first timing estimating means using said first timing estimated result and said second timing estimated  
20   result; and

          transmission means for performing transmission processing on transmission data using a sampling timing with a phase synchronized with the timing estimated result obtained in said second timing estimating means.

25           9.     A reception apparatus comprising:

          third timing estimating means for performing timing estimation of a received signal at a predetermined

sampling timing to output a third timing estimated result; and

fourth timing estimating means for performing timing estimation based on a correlation value ratio of  
5 known signals between samples sampled at said sampling rate and said third timing estimated result to output a fourth timing estimated result.

10. The reception apparatus according to claim 9, further comprising:

10 propagation path estimating means for estimating a propagation path condition; and

update means for updating said correlation value ratio based on said propagation path condition.

11. A reception apparatus comprising:

15 storage means for storing filter tap coefficients each with a characteristic for canceling intersymbol interference with a known signal in a received signal sampled at a sampling timing shifted a unit time shorter than a sampling duration of a predetermined sampling  
20 rate;

an intersymbol interference filter for performing filtering on the received signal using said filter tap coefficients to output a plurality of filtering results; and

25 fifth timing estimating means for performing timing estimation based on said plurality of filtering results.

12. The reception apparatus according to claim 11,

further comprising:

demodulation means for performing demodulation processing on data in said received data using a timing estimated result obtained in said fifth timing  
5 estimating means.

13. A reception apparatus comprising:

third timing estimating means for performing timing estimation of a received signal at a predetermined sampling timing to output a third timing estimated  
10 result;

fourth timing estimating means for performing timing estimation based on a correlation value ratio of known signals between samples sampled at said sampling rate and said third timing estimated result;

15 storage means for storing filter tap coefficients each with a characteristic for canceling intersymbol interference with a known signal in a received signal sampled at a sampling timing shifted a unit time shorter than a predetermined sampling duration; and

20 an intersymbol interference filter for performing filtering on the received signal with a filter tap coefficient selected using the timing estimated result obtained in said fourth timing estimating means.

14. A communication terminal apparatus provided  
25 with a reception apparatus, said reception apparatus comprising:

first timing estimating means for performing timing

estimation of a received signal at a first sampling timing to output a first timing estimated result, while performing timing estimation of said received signal at a second sampling timing with a predetermined phase difference with respect to said first sampling timing to output a second timing estimated result;

switching control means for switching said first sampling timing and said second sampling timing; and second timing estimating means for performing timing estimation with time resolution twice that in said first timing estimating means using said first timing estimated result and said second timing estimated result.

15. A communication terminal apparatus provided with a reception apparatus, said reception apparatus comprising:

third timing estimating means for performing timing estimation of a received signal at a predetermined sampling timing to output a third timing estimated result; and

fourth timing estimating means for performing timing estimation based on a correlation value ratio of known signals between samples sampled at said sampling rate and said third timing estimated result.

16. A communication terminal apparatus provided with a reception apparatus, said reception apparatus comprising:

storage means for storing filter tap coefficients each with a characteristic for canceling intersymbol interference with a known signal in a received signal sampled at a sampling timing shifted a unit time shorter than a sampling duration of a predetermined sampling duration;

an intersymbol interference filter for performing filtering on the received signal using said filter tap coefficients to output a plurality of filtering results; and

fifth timing estimating means for performing timing estimation based on said plurality of filtering results.

17. A device having a memory storing a reception timing estimating program, said reception timing estimating program including the procedures of:

performing first timing estimation of a received signal at a first sampling timing to output a first timing estimated result, while performing second timing estimation of said received signal at a second sampling timing with a predetermined phase difference with respect to said first sampling timing to output a second timing estimated result;

switching said first sampling timing and said second sampling timing; and

performing timing estimation with time resolution twice that in performing said first timing estimation and said second timing estimation using said first timing

estimated result and said second timing estimated result.

18. A device having a memory storing a reception timing estimating program, said reception timing  
5 estimating program including the procedures of:

performing timing estimation of a received signal at a predetermined sampling timing to output a third timing estimated result; and

performing timing estimation based on a correlation  
10 vale ratio of known signals between samples sampled at said sampling rate and said third timing estimated result to output a fourth timing estimated result.

19. A device having a memory storing a reception timing estimating program and filter tap coefficients  
15 each with a characteristic for canceling intersymbol interference with a known signal in a received signal sampled at a sampling timing shifted a unit time shorter than a sampling duration of a predetermined sampling rate, said reception timing estimating program including the  
20 procedures of:

performing filtering on the received signal with said filter tap coefficients to output a plurality of filtering results; and

performing timing estimation based on said  
25 plurality of filtering results.

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